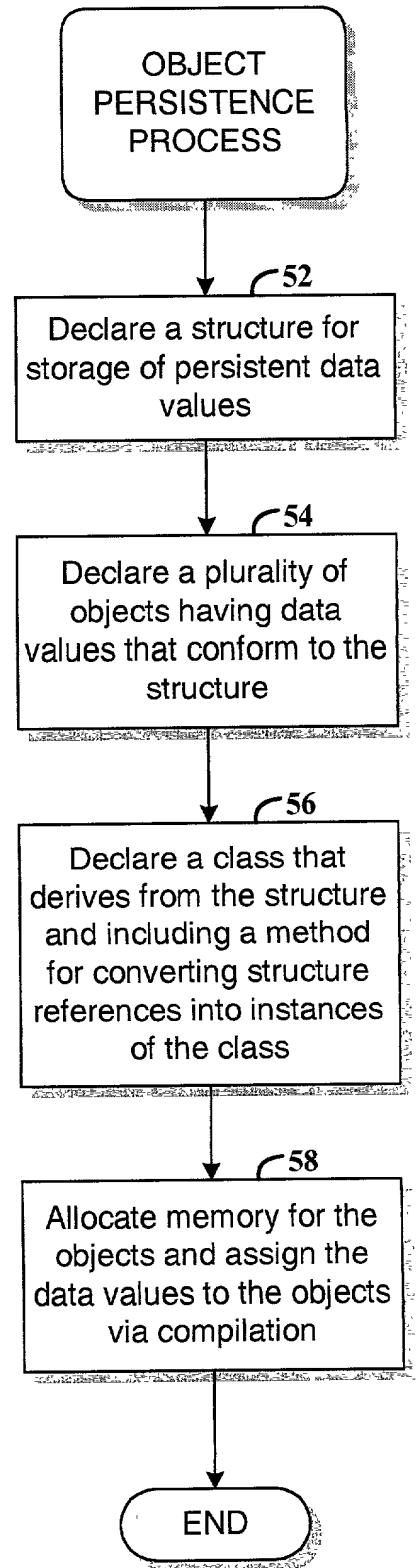


**FIG. 1**



**FIG. 2**

102

*example  
structure*

```

struct SPerson
{
    char *m_name;
    unsigned long m_dob;
};

```

**FIG. 3**

104

*example  
class*

```

class CPerson : private SPerson
{
public:
    static CPerson &convertTo( SPerson &from )
    {
        return static_cast< CPerson &>( from );
    }
};

```

**FIG. 4**

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*example  
code*

```

{
    ...
    SPerson myData =
    {
        "John Smith",
        19620612
    }

    CPerson &me = CPerson::convertTo( myData );
    ...
}

```

**FIG. 5**

example  
traits

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```

class CPersonTraits
{
public:
    typedef CPerson type;
    typedef SPerson data;
    typedef SPerson base;
};

class CCarTraits
{
public:
    typedef CCar type;
    typedef SCar data;
    typedef SCar base;
};

struct SCar
{
    char *m_make;
    char *m_model;
    CPersonTraits::data *m_owner;
};

class CPerson : private CPersonTraits::base
{
public:
    typedef CPersonTraits traits;

    static traits::type &convertTo( traits::data &from )
    {
        return static_cast< traits::type &>( from );
    }
};

class CCar : private CCarTraits::base
{
public:
    typedef CCarTraits traits;

    static traits::type &convertTo( traits::data &from )
    {
        return static_cast< traits::type &>( from );
    }

    CPerson &owner()
    {
        return CPerson::convertTo( *m_owner );
    }
};
  
```

**FIG. 6**

110

*example  
collection*

```
template< class CollectionTraits >
struct SStructCollection
{
    unsigned int m_size;
    CollectionTraits::collectionData *m_first;
};
```

**FIG. 7**

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```
template< class TypeTraits, class Initializer = CNullStructCollectionInitializer<
TypeTraits > >
class CStructCollectionTraits
{
public:
    typedef TypeTraits::data collectionData;
    typedef TypeTraits::type collectionType;

    typedef CStructCollection< CStructCollectionTraits< TypeTraits, Initializer >
        > type;
    typedef SStructCollection< CStructCollectionTraits< TypeTraits, Initializer >
        > base;
    typedef SStructCollection< CStructCollectionTraits< TypeTraits, Initializer >
        > data;

    typedef CCollectionIterator< TypeTraits > iterator;

    typedef Initializer initializer;
};
```

**FIG. 8**

*example  
collection  
iterator*

```
template< class TypeTraits >
class CCollectionIterator
{
public:
    typedef TypeTraits::data data;
    typedef TypeTraits::type type;

    CCollectionIterator( data *begin ) : m_p( begin ) {}
    CCollectionIterator( const CCollectionIterator< TypeTraits > &from ) : m_p(
        from.m_p ) {}
    CCollectionIterator &operator =( const CCollectionIterator< TypeTraits >
        &from )
    {
        m_p = from.m_p;

        return *this;
    }
    ~CCollectionIterator() {}

    type *operator ->()
    {
        return &type::convertTo( *m_p );
    }

    type &operator *()
    {
        return type::convertTo( *m_p );
    }

    CCollectionIterator< TypeTraits > &operator ++()
    {
        ++m_p;

        return *this;
    }
}
```

**FIG. 9A**

*example  
collection  
iterator*

```
data *pointer()
{
    return m_p;
}

CCollectionIterator< TypeTraits > operator +( int addend ) const
{
    return m_p + addend;
}

CCollectionIterator< TypeTraits > operator -( int addend ) const
{
    return m_p - addend;
}

bool operator !=( const CCollectionIterator< TypeTraits > &to ) const
{
    return m_p != to.m_p;
}

bool operator <( const CCollectionIterator< TypeTraits > &to ) const
{
    return m_p < to.m_p;
}

private:
    data *m_p;
};
```

**FIG. 9B**

```

template< class TypeTraits >
class CStructCollectionInitializer
{
public:
    typedef TypeTraits::collection collection;

    inline CStructCollectionInitializer( collection::traits::data &collectionData )
    :
        m_collection( collection::convertTo( collectionData ) )
    {
        for ( collection::traits::iterator i = m_collection.begin(); i < m_collection.end();
              ++i )
        {
            new( i.pointer() ) TypeTraits::type;
        }
    }

    inline ~CStructCollectionInitializer()
    {
        for ( collection::traits::iterator i = m_collection.begin(); i < m_collection.end();
              ++i )
        {
            typedef collection::traits::collectionType collectionType;

            i->collectionType::~~collectionType();
        }
    }
private:
    collection &m_collection;
};

```

*example*  
*collection*  
*initializer*

**FIG. 10**

*example  
pre-processor  
macro*

```
#define COLLECTION_BEGIN( TypeTraits, CollectionName ) \
TypeTraits::data CollectionName##Collection[] = \
{

#define COLLECTION_END( TypeTraits, CollectionName ) \
}; \
TypeTraits::collection::traits::data CollectionName = \
{ \
    sizeof( CollectionName##Collection ) / sizeof( TypeTraits::data ), \
    CollectionName##Collection \
}; \
TypeTraits::collection::traits::initializer CollectionName##Initializer( \
    CollectionName );
```

**FIG. 11**

*example  
pre-processor  
forward referencing  
macro*

```
#define COLLECTION_FORWARD( TypeTraits, CollectionName ) \
TypeTraits::data CollectionName##Collection[];
```

**FIG. 12**

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*example  
pre-processor  
inter-collection  
reference macro*

```
#define ENTRY_REF( CollectionName, Element ) \  
&CollectionName##Collection[ ( Element ) ]
```

**FIG. 13**

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*example  
pre-processor  
empty collection  
macro*

```
#define COLLECTION_NO_ENTRIES( TypeTraits, CollectionName ) \  
TypeTraits::collection::traits::data CollectionName = { 0, 0 };
```

**FIG. 14**

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*example aggregate  
supporting  
virtual data members*

```
template< class TypeTraits, unsigned int N = 1  
>  
struct SVirtualSupport  
{  
    struct  
    {  
        void *m_vptrs[ N ];  
        TypeTraits::base m_data;  
    };  
    void ( *m_initializer )( void *where );  
};
```

**FIG. 15A**

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```
template< class TypeTraits >
class CInstanceInitializer
{
public:
    static void initialize( void *where )
    {
        new( where ) TypeTraits::type;
    }
};
```

*example*  
*vfpointer*  
*initialization*

**FIG. 15B**

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```
class CCarTraits
{
public:
    typedef CCar type;
    typedef SVirtualSupport< CCarTraits > data;
    typedef SCar base;
    typedef CInstanceInitializer< CCarTraits > initializer;
};
```

*example*  
*vfpointer*  
*initialization*

**FIG. 15C**

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```
{
    ...
    CCar::traits::data carData =
    {
        { { 0 }, { "Ford", "Escort", &personCollection[ 0 ] }, CCarTraits::initializer }
    };

    ( *carData.m_initializer )( carData ); // initialize car instance.

    CCar &car = CCar::convertTo( carData ); // produce a real CCar instance
                                           // from the already initialized data.
    ...
}
```

*example*  
*vfpointer*  
*initialization*

**FIG. 15D**